

OS-02: THE IMPACT OF CLIMATE AND EXTREME WEATHER EVENTS ON MILITARY OPERATIONS

J. W. Weatherly and D. R. Hill

U.S. Army Engineering Research and Development Center, Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire, 03755

ABSTRACT

The range of climate and extreme weather events, including high and low temperatures, drought and floods, high and damaging winds, and heavy or blowing snow have significant impacts on military operations. These impacts include increased risk to life and safety, injury, and a degrading effect on mission performance. The effects of snow are felt across a range of tasks from intelligence gathering by sensors to mobility of vehicles and personnel. A comprehensive review of the impacts of snow and weather on military operations is in progress, which will produce a geographic database of climate, extreme weather and snow impacts on military operations.

1. INTRODUCTION

Numerous military studies cite weather as one of the major factors in battle, with examples from the Revolutionary War to Operation Desert Storm. This relates particularly to cold weather environments:

“The first threat is the physical environment. The second is the enemy force....cold can kill, cold will produce casualties; cold will significantly increase logistical problems; and even the best trained troops are subject to cold weather injury and death.” (Durrant 1992).

Commanders planning military campaigns need to evaluate the impact of weather and climate on factors such as vehicle mobility, soldier performance, fuel consumption, water resources, and visibility. Climatological meteorological data for geographic regions can be used to assess these impacts over periods of weeks to years. The climatology represents the average conditions that might be expected to impact military operations. However, soldiers actually experience daily weather variations which are usually very different from the climatology. Daily weather can have a large impact on operations, particularly when extreme weather events disrupt

both military and civilian functions. These events may either be short-term events, such as heavy precipitation, snow and ice storms, and tropical cyclones, or longer-term events, such as extended cold temperatures, heat waves and drought.

2. DISCUSSION

Evaluating the impacts of weather requires not only climatological average data, but also the frequency of extreme events that affect military operations. The conference paper will describe significant impacts that both climate and extreme weather events have on military operations at the tactical, operational and strategic levels.

At the tactical level, the climate and its extremes affect soldier and unit issues and DOTMLPF: doctrine, organization, training, materiel, leaders, personnel, and facilities. Training and doctrine have been established, for example, for operations in desert, tropical, and for cold climates. Training soldiers to be prepared to maneuver and fight in the face of changing weather can be essential for success. Data on the frequency of extremes for specific regions would add information to synchronizing forces under the full range of conditions.

At the operational level, climate and extreme weather have an effect on the design and organization of successful campaigns, theater operations, and battles. Campaigns launched in environments of tropical storms, monsoon season, or extreme desert heat are clearly affected by the expected climate. The climate will impact force projection strategies as well as exit strategies after succession of military operations. Extreme weather events can cause delays and disruptions in plans for mobility, lines of communication, points of embarkation, logistics and support. Restoring national utilities, food production, water resources, etc. can be considerably hindered by the frequency of extreme weather.

At the strategic level, climate and extreme weather affect the national (and international)

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 00 DEC 2004		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE The Impact Of Climate And Extreme Weather Events On Military Operations				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Engineering Research and Development Center, Cold Regions Research and Engineering Laboratory Hanover, New Hampshire, 03755				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM001736, Proceedings for the Army Science Conference (24th) Held on 29 November - 2 December 2005 in Orlando, Florida.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 2	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

resources employed in addressing our national security objectives. Training lands used for development are affected by weather and climate, which can determine where suitable grounds for training exist. Installations, both within the U.S. and in foreign lands, have operating and maintenance costs that are tied to both climate and the frequency of extreme weather, such as heating and cooling costs, damage by tropical storms and periodic floods. Selecting locations for new installations within and outside the U.S. needs to be accomplished with updated data on both climate and frequencies of extreme weather. The requirements for developing new aircraft, ground vehicles and ships are also affected by the range of extreme weather conditions that this equipment is expected to maneuver through.

Incorporating data on extreme weather events into the climatology used by the Army is an idea in the embryonic stage. Examples of the types of data on extreme events that could be incorporated into Army products are: heavy precipitation and flooding; heavy snowfalls, blizzards, ice and dust storms; heat waves, cold waves; drought; and tropical storms. Some of this data is readily available for developed regions of the globe, and some must be developed from secondary sources.

The U.S. Army Engineering Research and Development (ERDC) conducts research on extremes in environment relevant to the Army, the Corps of Engineers, and the Dept. of Defense. Applications using climatological data to evaluate the terrain state, including soil moisture and strength, are being developed under the Battlespace Environment research program. Climatological data, remotely sensed data, and numerical weather modeling are employed in regions where direct meteorological measurements are not available. The objective is to develop GIS maps that incorporate layers of terrain and weather, analyses of mobility, obstacles and locations of tactical advantage for Army maneuvers.

ACKNOWLEDGEMENTS

This research is sponsored by the U.S. Army under the AT59 research program for the project "Snow Distribution – Impacts on Military Operations" and the Technical Directors Office of the Cold Regions Research and Engineering Laboratory.

REFERENCES

- Durrant, J. L., 1992: In Every Clime and Place: USMC Cold Weather Doctrine. *School of Advanced Military Studies, Monograph 19911220*.